



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/763,269

01/26/2004

Shigehisa Tanaka

ASAM.0098

6471

7590

02/22/2005

Stanley P. Fisher

Reed Smith LLP

Suite 1400

3110 Fairview Park Drive

Falls Church, VA 22042-4503

EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 02/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/763,269

Applicant(s)

TANAKA ET AL.

Examiner

Wai-Sing Louie

Art Unit

2814

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 1/26/04.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3 and 5-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pauchard et al. (US 6,384,462) in view of Clark (US 6,794,631).

With regard to claims 1-2 and 6-7, Pauchard et al. disclose an avalanche photodetector, APD, (col. 4, line 29 to col. 7, line 15 and fig. 4) comprising:

- An absorption layer 11 absorbing light to create carriers (col. 4, lines 35-36 and fig. 4);
- A multiplication layer 14 multiplying the created carriers (col. 5, lines 23-25 and fig. 4), where the multiplication layer 14 is formed of Si (col. 4, line 64) and the absorption layer 11 is formed of a compound semiconductor (col. 4, line 36), and
- Pauchard et al. do not disclose an interface layer between the multiplication layer 14 and the absorption layer 11. However, Clark discloses a grading layer 106 between the multiplication layer 104 and absorption layer 107 (Clark col. 4, lines 54-57 and fig. 2). Clark teaches the grading layer facilitate the transfer of charge carriers between these two regions (Clark col. 4, lines 61-62). Pauchard et al. and Clark have substantially the same environment of APD having the InGaAs

absorption layer. Therefore, it would have been obvious for the one with ordinary skill in the art to modify Pauchard's device with the teaching of Clark to provide an interface layer between the multiplication layer and the absorption layer in order to facilitate the carriers transfer. The bandgap of the InGaAlAs interface layer in Clark is larger than the bandgap of the InGaAs absorption layer (Clark col. 4, line 64 and col. 5, line 7).

With regard to claim 3, Pauchard et al. modified by Clark do not disclose the interface layer is made of InP or GaAs material. However, Clark teaches the interface (grading) layer could be a plurality of graded layers (Clark col. 4, lines 58-60) and have to be lattice matched to the InP substrate (Clark col. 4, line 46). Therefore, it would have been obvious for the one skilled in the art to form the interface layers with the mixed semiconductor crystal from InP to GaAs as long as it is lattice matched with the InP substrate.

With regard to claim 5, Pauchard et al. disclose the absorption layer 11 is fused to the multiplication layer 14 (col. 4, lines 41-43). Therefore, Pauchard et al. modified by Clark in claim 1 above, would have an interface layer, where the junction between the multiplication layer 14 and the interface layer is fused together.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Pauchard et al. (US 6,384,462) modified by Clark (US 6,794,631) as applied to claim 1 above, and further in view of Razeghi et al. (US 5,650,635).

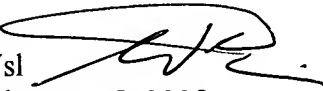
With regard to claim 4, Pauchard et al. modified by Clark do not disclose the absorption layer is formed of a semiconductor containing Sb. However, Razeghi et al. disclose InGaSb (Razeghi col. 5, line 42 to col. 6, line 4, Example 3, and fig. 2). Razeghi et al. teach the Sb-based semiconductor heterostructure for used in photodetector could reduce dark current and increase resistance for use at room temperature (Razeghi col. 1, lines 9-13). Pauchard et al. and Razeghi et al. have substantially the same environment of photodetector having mixed semiconductor crystal absorption layer. Therefore, it would have been obvious at the time the invention was made to modify Pauchard's device with the teaching of Clark and Razeghi et al. to provide Sb-based compound for the absorption layer in order to reduce dark current and increase resistance of the device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (571) 272-1709. The examiner can normally be reached on 7:30 AM to 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2814

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Wsl
February 15, 2005.